AMENDMENTS TO THE CLAIMS

Following is a listing of all claims in the present application, which listing supersedes all previously presented claims:

1-16. (Canceled)

17. (Currently Amended) A fuel cell having a membrane-electrode assembly, comprising:

a proton exchange polymer membrane;

catalytic metal particles coated on the proton exchange polymer membrane;

carbon particles coated on the proton exchange polymer membrane, the catalytic metal particles and the carbon particles forming a nanophase catalyst layer; and

electrodes bonded to the proton exchange polymer membrane;

wherein the membrane-electrode assembly ~~being~~ is fabricated by a method[[,]] ~~the method~~ comprising:

coating the catalytic metal particles on [[a]] the proton exchange polymer membrane by sputtering a catalytic metal source;

coating the carbon particles on the proton exchange polymer membrane by arc discharging or by sputtering a carbon source to form [[a]] the nanophase catalyst layer; and

bonding the electrodes to the proton exchange polymer membrane having the nanophase catalyst layer.

18 (Previously Presented) The fuel cell as claimed in claim 17, wherein the catalytic metal source is pure platinum (Pt), an alloy or a mixture of Pt and at least one metal selected from the group consisting of gold (Au), palladium (Pd), rhodium (Rh), iridium (Ir), ruthenium (Ru), tin (Sn), and molybdenum (Mo); and the carbon source is selected from the group consisting of graphite and carbon rod.

19. (Previously Presented) The fuel cell as claimed in claim 17, wherein the catalyst layer has a thickness of 10-100 nm, and the coated catalytic metal and carbon particles have a particle size of 2-10 nm.

20. (Previously Presented) The fuel cell as claimed in claim 17, wherein the amount of the catalytic metal loading per electrode area is in the range of 0.01-0.2 mg/cm^2 for a proton exchange membrane fuel cell, and is in the range of 0.1-2 mg/cm^2 for a direct methanol fuel cell.

21. (Previously Presented) The fuel cell as claimed in claim 17, wherein the amount of the catalytic metal coated is in the range of 20-85% by weight based on the total weight of the catalytic metal and the carbon particles.

22. (Previously Presented) The fuel cell as claimed in claim 17, wherein sputtering the catalytic metal source or the carbon source is carried out at a gas pressure of 10-1,000 Pa with a power of 100-400 W.

23. (Previously Presented) The fuel cell as claimed in claim 17, wherein the arc discharging is carried out at a gas pressure of 10-1,000 Pa and a discharge current of 100A or less.

24. (Currently Amended) A fuel cell having a membrane-electrode assembly, comprising:

a proton exchange polymer membrane;

catalytic metal particles coated on the proton exchange polymer membrane;

carbon particles coated on the proton exchange polymer membrane, the catalytic metal particles and the carbon particles forming a nanophase catalyst layer; and

electrodes bonded to the proton exchange polymer membrane;

wherein the membrane-electrode assembly ~~being~~ is fabricated by a method[[,]] ~~the method~~ comprising:

coating the catalytic metal and carbon particles on [[a]] the proton exchange polymer membrane by simultaneously sputtering a catalytic metal source and a carbon source to form [[a]] the nanophase catalyst layer; and

bonding the electrodes to the proton exchange polymer membrane having the catalyst layer.

25. (Previously Presented) The fuel cell as claimed in claim 24, wherein the catalytic metal source is pure platinum (Pt), an alloy or a mixture of Pt and at least one metal selected from the group consisting of gold (Au), palladium (Pd), rhodium (Rh), iridium (Ir), ruthenium (Ru), tin (Sn), and molybdenum (Mo); and the carbon source is selected from the group consisting of graphite and carbon rod.

26. (Previously Presented) The fuel cell as claimed in claim 24, wherein the catalyst layer has a thickness of 10-100 nm, and the coated catalytic metal and carbon particles have a particle size of 2-10 nm.

27. (Previously Presented) The fuel cell as claimed in claim 24, wherein the amount of the catalytic metal loading per electrode area is in the range of 0.01-0.2 mg/cm^2 for a proton exchange membrane fuel cell, and is in the range of 0.1-2 mg/cm^2 for a direct methanol fuel cell.

28. (Previously Presented) The fuel cell as claimed in claim 24, wherein the amount of the catalytic metal coated is in the range of 20-85% by weight based on the total weight of the catalytic metal and the carbon particles.

29. (Previously Presented) The fuel cell as claimed in claim 24, wherein sputtering the catalytic metal source or the carbon source is carried out at a gas pressure of 10-1,000 Pa with a power of 100-400 W.

30. (Previously Presented) The fuel cell as claimed in claim 24, wherein the arc discharging is carried out at a gas pressure of 10-1,000 Pa and a discharge current of 100A or less.

31. (New) A fuel cell having a membrane-electrode assembly, comprising:

a proton exchange polymer membrane;

2-10 nm catalytic metal particles coated on the proton exchange polymer membrane;

2-10 nm carbon particles coated on the proton exchange polymer membrane, the catalytic metal particles and the carbon particles forming a nanophase catalyst layer; and

electrodes bonded to the proton exchange polymer membrane.

32. (New) The fuel cell as claimed in claim 31, wherein the nanophase catalyst layer has a thickness of 10-100 nm.

33. (New) The fuel cell as claimed in claim 31, wherein the catalytic metal is pure platinum (Pt), an alloy or a mixture of Pt and at least one metal selected from the group consisting of gold (Au), palladium (Pd), rhodium (Rh), iridium (Ir), ruthenium (Ru), tin (Sn), and molybdenum (Mo).

34. (New) The fuel cell as claimed in claim 31, wherein the amount of the catalytic metal loading per electrode area is in the range of 0.01-0.2 mg/cm^2 for a proton exchange membrane fuel cell, and is in the range of 0.1-2 mg/cm^2 for a direct methanol fuel cell.

35. (New) The fuel cell as claimed in claim 31, wherein the amount of the catalytic metal coated is in the range of 20-85% by weight based on the total weight of the catalytic metal and the carbon particles.